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**BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

Paper No. 0104

Application Number: 09/604,218
Filing Date: June 27, 2000
Appellant(s): HIDAYETOGLU, TULIN KUZULUGIL



Daniel S. Kalka
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed November 21, 2003.

*(1) Real Party in Interest*

A statement identifying the real party in interest is contained in the brief.

*(2) Related Appeals and Interferences*

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

*(3) Status of Claims*

The statement of the status of the claims contained in the brief is incorrect. A correct statement of the status of the claims is as follows:

Claims 1-8, 11-15, 20-23 have been rejected.

Claims 9, 10, 16-19 have been canceled (Claims 16-19 have been canceled in the Applicant's Response of November 28, 2001).

No claims have been allowed.

*(4) Status of Amendments After Final*

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

*(5) Summary of Invention*

The summary of invention contained in the brief is correct.

*(6) Issues*

The appellant's statement of the issues in the brief is substantially correct. The changes are as follows: rejection of claim 5 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention has been withdrawn. The Examiner notes that it is clear from the

construction of the sentence that a phrase "has been withdrawn" was inadvertently omitted in the Final Office Action of June 30, 2003 especially considering the fact that Applicants amended the claim 5 to overcome the rejection over trademark "Kevlar".

***(7) Grouping of Claims***

Appellant's brief includes a statement that claims 1-8, 11-15, 20-23 do not stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

***(8) Claims Appealed***

The copy of the appealed claims contained in the Appendix to the brief is correct.

***(9) Prior Art of Record***

| | | |
|---|---|---|
| 6,156,787 | BOOHER | 10-92 |
| 6,001,440 | MIYAMOTO ET AL | 12-99 |
| 6,098,612 | NAKAMOTO ET AL | 8-2000 |

***(10) Grounds of Rejection***

The following ground(s) of rejection are applicable to the appealed claims:

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

**Claims 1-8, 11, 12, 20, 21, 23** are rejected under 35 U.S.C. 103(a) as being unpatentable over Booher (US 5,156,787) in view of Miyamoto et al (US 6,001,440).

As to claim 1-8, 11, 12, 20, Booher discloses a clutch pad (See column 2, lines 65-66; column 3, lines 1-6) with improved wear resistance (See column 1, lines 18-23; 30-33), comprising a functionally graded material including a composite material having heat and wear resistant fibers (See column 2, lines 28-45) comprising aramid fibers (See column 2, line 33) therein impregnated with a resin (See Fig. 1; column 1, line 62); and a plurality of heat conducting elements situated within said functionally graded material in a selected orientation and spatial distribution such as evenly distributed carbon fibers (filaments) oriented perpendicular to a friction surface (See Fig. 2; column 2, lines 29-34, 61-68; column 3, lines 3-6) and (uniformly dispersed) metal components such as copper powder, copper alloy powder (See column 2, lines 58-60) to enhance the dissipation of heat (See column 2, lines 58-60).

The Examiner Note: a clutch pad reads on claimed clutch facing material because the clutch pad is supposed to be located on the "face" of the clutch with one surface engaging a movable, engageable part.

Booher fails to teach that the heat conducting elements are situated within said functionally graded material with a varying concentration so that the concentration of the heat conducting elements decreases from the first engaging friction surface to the second non-engaging surface for transferring heat away from the first friction surface (Claim 1) so that the heat conducting elements comprise a greater density on said first friction surface than non-engaging surface (Claims 8, 20).

Miyamoto et al teach that when a mixture of heat conductive elements (See column 2, lines 37-38) including copper powder or preferably *fibrous* copper (See column 4, lines 52-54; column 2, lines 57-60;) are dispersed in polyimide film (a composite material) with a concentration gradient (See column 2, lines 16-18) in the direction of the thickness of the film so

that the concentration of the heat conducting elements decreases from the hot surface (See column 2, lines 38-50), it *unexpectedly* ***doubles*** *thermal conductivity* of the film (See column 7, lines 16-33) in contrast to uniformly dispersed heat conducting elements (See column 2, lines 37-50). The produced polyimide film can be used as a *heat dissipating medium* (See column 6, lines 18-23) in various fields where heat accumulation may cause problems (See Abstract) such as in printed IC boards (See column 6, lines 23-32; column 7, lines 43-47). Although Miyamoto et al do not expressly show that in a *heat dissipating medium* higher concentration of the heat conducting elements is also at hot surface, the Examiner takes a position that higher concentration of the heat conducting elements should also be on the side of heat because there should be *intensive heat exchange*.

In other words, a secondary reference of Miyamoto et al is relied upon to show that thermal conductivity of composite polyimide films with heat conductive elements having concentration gradient achieves unexpectedly higher thermal conductivity than that of *the same* composite polyimide films with uniform distribution of heat conductive elements (See column 7, lines 26-28; column 2, lines 36-50), and this effect *does not depend* on **shape** (e.g. planar or cylindrical) or **thickness** (e.g. thickness may vary up to 15 times) of composite polyimide films (See column 3, lines 29-34). Therefore, this is purely effect of concentration gradient of heat conductive elements in a composite heat dissipating medium since **all other things are equal**. One of ordinary skill in the art at would have reasonable expectation of success in using teaching of Miyamoto et al in producing a heat dissipating medium for the use in any field where problem of heat accumulation occurs no matter what composite material with what thickness is used as the heat dissipating medium.

Therefore, although Miyamoto et al is not in the same field with Booher, Miyamoto et al can be relied upon as a basis for rejection of the claimed invention since **Miyamoto et al is reasonably pertinent to the particular problem with which the applicant was concerned**.

It has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified a composite material of Booher by varying concentration of the heat conducting elements so that their concentration decreases from the first engaging friction (hot) surface to the second non-engaging surface with the expectation of providing the desired improved thermal conductivity, since Miyamoto et al teach that concentration gradient of heat conductive elements in composite material with higher density at hot surface achieves unexpected increase in thermal conductivity (i.e. in heat dissipating property) compared to uniform distribution of the heat conductive elements so that composite material with concentration gradient of heat conductive elements may be successfully used as heat dissipating medium in various fields where heat accumulation may cause problems.

As to claims 21, 23, Booher in view of Miyamoto et al fails to teach that the concentration of the heat conducting elements on the first friction surface ranges between about 22.5% to about 42.5 wt% (Claim 21); and the decrease in concentration of the heat conducting elements is over a depth of 0.05-0.1 inch (Claim 23).

Miyamoto et al further teach that the higher the concentration of the heat conducting elements the better thermal conductivity (See column 4, lines 32-39). Thus, heat dissipation can

be controlled not only by concentration gradient of the heat conducting elements in the thickness direction, but also by the amount of the heat conducting elements. In other words, concentration of the heat conducting elements and pattern of concentration gradient in thickness direction are result-effective variables in heat dissipating process.

It is held that it is not inventive to discover the optimum or workable ranges of result-effective variables by routine experimentation. In re Antonie, 559 F.2d 618, 195 USPQ 6 (CCPA 1977). See also In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). Also, it is held that concentration limitations are obvious absent a showing of criticality. Akzo v. E.I. du Pont de Nemours 1 USPQ 2d 1704 (Fed. Cir. 1987).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have discovered the optimum or workable ranges of concentration of the heat conducting elements and concentration gradient in thickness direction (including those of claims 21, 23) in a clutch pad of Booher in view of Miyamoto et al by routine experimentation in the absence of a showing of criticality.

**Claims 13-15, 22** are rejected under 35 U.S.C. 103(a) as being unpatentable over Booher (US 5,156,787) in view of Miyamoto et al (US 6,001,440), further in view of Nakamoto et al (US 6,098,612).

Booher in view of Miyamoto et al, as applied above, fails to teach that the metal components in a composite material such as copper components (Claim 14) are oriented perpendicular to the engaging surface (Claim 15), and the copper components are copper threads (Claim 13) being woven with the aramid fibers (Claim 22).

Nakamoto et al teach that a woven fabric containing combination of synthetic yarns with a metal powder dispersed in a resin material is a functionally equivalent to a woven fabric made

up of metallic fibers such as copper threads and fibers other than the metallic fibers for the use as high heat diffusion material (See column 16, lines 38-51). Again, although Nakamoto et al is not in the same field with Booher, Nakamoto et al can be relied upon as a basis for rejection of the claimed invention since Nakamoto et al is reasonably pertinent to the particular problem with which the applicant was concerned.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used copper threads woven in with other fibers instead of copper powder in a composite material of Booher in view of Miyamoto et al since Nakamoto et al teach that a woven fabric containing synthetic yarns with a metal powder dispersed in a resin material is functionally equivalent to a woven fabric made up of metallic fibers such as copper threads and fibers other than the metallic fibers for the use as high heat diffusion material.

Booher, as applied above, further teaches that heat conducting carbon fibers woven in with other fibers such as aramid fibers (See column 2, lines 31-34) oriented perpendicular to a friction surface (See Fig. 2; column 2, lines 29-34, 61-68; column 3, lines 3-6) enhance the dissipation of heat (See column 2, lines 58-60).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to have oriented heat conducting copper components such as copper threads woven in with other fibers in a composite material of Booher in view of Miyamoto et al perpendicular to a friction surface with the expectation of providing the desired enhanced dissipation of heat since Booher teaches that heat conducting fibers oriented perpendicular to a friction surface enhance dissipation of heat.

***(11) Response to Argument***

Applicants' arguments filed November 21, 2003 have been fully considered but they are not persuasive.

(A) Applicants argue that Miyamoto et al is nonanalogous art since Miyamoto et al is quite specifically directed to a heat conductive polyimide film particularly suited for use in thin film applications such as electrophotographic copying machines, laser printers or toner image applications.

The Examiner respectfully disagrees with this argument. As was discussed above, Miyamoto et al teach that thermal conductivity of composite polyimide films with heat conductive elements having concentration gradient is unexpectedly higher than thermal conductivity of *the same* composite polyimide films with uniform distribution of heat conductive elements (See column 7, lines 26-28; column 2, lines 36-50), and this effect *does not depend* on **shape** (e.g. planar or cylindrical) or **thickness** (e.g. thickness may vary up to 15 times) of composite polyimide films (See column 3, lines 29-34), i.e. this is purely effect of concentration gradient of heat conductive elements in a composite heat dissipating medium since **all other things are equal**. Therefore, one of ordinary skill in the art at would have reasonable expectation of success in using teaching of Miyamoto et al in producing a heat dissipating medium for the use in any field where problem of heat accumulation occurs no matter what composite material with what thickness is used as the heat dissipating medium.

(B) Applicants argue that Nakamoto et al is nonanalogous art.

Again, although Nakamoto et al is not in the same field with Booher, Nakamoto et al can be relied upon as a basis for rejection of the claimed invention since Nakamoto et al is reasonably pertinent to the particular problem with which the applicant was concerned.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Elena Tsoy
Examiner, AU 1762
January 7, 2004

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